

What Is Claimed Is:

1. An optically compensated birefringence mode liquid crystal display device,
comprising:
 - first and second substrates facing and spaced apart from each other;
 - a liquid crystal material layer between the first and second substrates, the
liquid crystal material layer having a splay state when a voltage is not applied and
having a bend state when a transition voltage is applied;
 - a first compensation film on an outer surface of the first substrate;
 - a first polarizing plate on the first compensation film;
 - a second compensation film on an outer surface of the second substrate; and
 - a second polarizing plate on the second compensation film,wherein the liquid crystal material layer in the splay state has a first
retardation value (R1) according to:

$$1.35 < R1/\lambda < 1.75$$

the liquid crystal material layer in the bend state has a second retardation value
(R2) according to:

$$0.5 < R2/\lambda < 0.7$$

when a white voltage for a white image is applied, and a third retardation value (R3) according to:

$$0.1 < R3/\lambda < 0.15$$

when a black voltage for a black image is applied.

2. The device according to claim 1, further comprising:

a first orientation film between the first substrate and the liquid crystal material layer; and

a second orientation film between the second substrate and the liquid crystal material layer,

wherein the first orientation film has the same alignment direction as the second orientation film.

3. The device according to claim 2, wherein the liquid crystal material layer in the bend state has a bend elastic modulus (K_{33}) and a dielectric constant anisotropy ($\Delta\epsilon$) according to:

$$0.85 < K_{33}/\Delta\epsilon < 1.5.$$

4. The device according to claim 2, wherein the liquid crystal material layer has a phase transition temperature (T_{ni}) from a nematic phase to an isotropic phase according to:

$$90\text{ }^{\circ}\text{C} < T_{ni} < 130\text{ }^{\circ}\text{C}.$$

5. The device according to claim 2, wherein the liquid crystal material layer has a ratio ($\Delta n_{LC}(400\text{ nm}/550\text{ nm})$) of refractive index anisotropy values for wavelengths of 400 nm and 550 nm according to:

$$1.2 < \Delta n_{LC}(400\text{ nm}/550\text{ nm}) < 1.3.$$

6. The device according to claim 2, wherein the first compensation film includes a first discotic liquid crystal film on the outer surface of the first substrate and a first biaxial film on the first discotic liquid crystal film, wherein the second compensation film includes a second discotic liquid crystal film on the outer surface of the second substrate and a second biaxial film on the second discotic liquid crystal film.

7. The device according to claim 6, wherein each of the first and second discotic films have a ratio ($\Delta n_{\text{discotic}}(400 \text{ nm}/550 \text{ nm})$) of refractive index anisotropy values for wavelengths of 400 nm and 550 nm according to:

$$1.2 < \Delta n_{\text{discotic}}(400 \text{ nm}/550 \text{ nm}) < 1.3.$$

8. The device according to claim 7, wherein each of the first and second discotic liquid crystal films have a ratio ($R_{\text{th}}/R_{\text{e}}$) of retardation values R_{th} and R_{e} defined by $R_{\text{th}} = \{n_z - (n_x + n_y)/2\}d$ and $R_{\text{e}} = (n_x - n_y)d$ according to:

$$2.8 \leq R_{\text{th}}/R_{\text{e}} \leq 3.2.$$

9. The device according to claim 8, further comprising a first TAC film on the first polarizing plate and a second TAC film on the second polarizing plate.

10. The device according to claim 9, wherein each of the first and second biaxial films and the first and second TAC films have a ratio ($R_{\text{th}}/R_{\text{e}}$) of retardation values R_{th} and R_{e} defined by $R_{\text{th}} = \{n_z - (n_x + n_y)/2\}d$ and $R_{\text{e}} = (n_x - n_y)d$ according to:

$$4.8 \leq R_{\text{th}}/R_{\text{e}} \leq 5.2.$$

11. A method of fabricating an optically compensated birefringence mode liquid crystal display device, comprising:

forming first and second substrates facing and spaced apart from each other;

forming a liquid crystal material layer between the first and second substrates, the liquid crystal material layer having a splay state when a voltage is not applied and having a bend state when a transition voltage is applied;

forming a first compensation film on an outer surface of the first substrate;

forming a first polarizing plate on the first compensation film;

forming a second compensation film on an outer surface of the second substrate; and

forming a second polarizing plate on the second compensation film,

wherein the liquid crystal material layer in the splay state has a first retardation value (R1) satisfying according to:

$$1.35 < R1/\lambda < 1.75$$

the liquid crystal material layer in the bend state has a second retardation value (R2) according to:

$$0.5 < R2/\lambda < 0.7$$

when a white voltage for a white image is applied, and a third retardation value (R3) according to:

$$0.1 < R3/\lambda < 0.15$$

when a black voltage for a black image is applied.

12. The method according to claim 11, further comprising:

forming a first orientation film between the first substrate and the liquid crystal material layer; and

forming a second orientation film between the second substrate and the liquid crystal material layer,

wherein the first orientation film has the same alignment direction as the second orientation film.

13. The method according to claim 12, wherein the liquid crystal material layer in the bend state has a bend elastic modulus (K_{33}) and a dielectric constant anisotropy ($\Delta\epsilon$) according to:

$$0.85 < K_{33}/\Delta\epsilon < 1.5.$$

14. The method according to claim 12, wherein the liquid crystal material layer has a phase transition temperature (T_{ni}) from a nematic phase to an isotropic phase according to:

$$90\text{ }^{\circ}\text{C} < T_{ni} < 130\text{ }^{\circ}\text{C}.$$

15. The method according to claim 12, wherein the liquid crystal material layer has a ratio ($\Delta n_{LC}(400\text{ nm}/550\text{ nm})$) of refractive index anisotropy values for wavelengths of 400 nm and 550 nm according to:

$$1.2 < \Delta n_{LC}(400\text{ nm}/550\text{ nm}) < 1.3.$$

16. The method according to claim 12, wherein the first compensation film includes a first discotic liquid crystal film on the outer surface of the first substrate and a first biaxial film on the first discotic liquid crystal film, wherein the second compensation film includes a second discotic liquid crystal film on the outer surface of the second substrate and a second biaxial film on the second discotic liquid crystal film.

17. The method according to claim 16, wherein each of the first and second discotic films have a ratio ($\Delta n_{\text{discotic}}(400 \text{ nm}/550 \text{ nm})$) of refractive index anisotropy values for wavelengths of 400 nm and 550 nm according to:

$$1.2 < \Delta n_{\text{discotic}}(400 \text{ nm}/550 \text{ nm}) < 1.3.$$

18. The method according to claim 17, wherein each of the first and second discotic liquid crystal films have a ratio ($R_{\text{th}}/R_{\text{e}}$) of retardation values R_{th} and R_{e} defined by $R_{\text{th}} = \{n_z - (n_x + n_y)/2\}d$ and $R_{\text{e}} = (n_x - n_y)d$ according to:

$$2.8 \leq R_{\text{th}}/R_{\text{e}} \leq 3.2.$$

19. The method according to claim 18, further comprising forming a first TAC film on the first polarizing plate and forming a second TAC film on the second polarizing plate.

20. The method according to claim 19, wherein each of the first and second biaxial films and the first and second TAC films have a ratio ($R_{\text{th}}/R_{\text{e}}$) of retardation values R_{th} and R_{e} defined by $R_{\text{th}} = \{n_z - (n_x + n_y)/2\}d$ and $R_{\text{e}} = (n_x - n_y)d$ according to:

$$4.8 \leq R_{\text{th}}/R_{\text{e}} \leq 5.2.$$